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## A REVIEW OF THE GENUS *CALISTO* (LEPIDOPTERA, SATYRINAE)

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This genus of butterflies was revised by Bates in 1935. However, several new forms have been described since that time, and it has seemed worth while to present a review of the genus.

*Calisto* is confined to the Greater Antilles and the Bahamas and is represented by eighteen species, placed in seven groups. Of these groups, one, consisting of a single species, is found in Jamaica; one, containing a single species, is found in Puerto Rico; one, represented by four closely related species, is found in Cuba, the Isle of Pines and the Bahamas; the remaining four groups, represented by twelve species, occur in Hispaniola.

Both in Cuba and Hispaniola there are closely related species (sibling species in the sense of Mayr<sup>1</sup>) having the same or overlapping ranges. In Cuba, where specimens of *C. herophile* Hübner and *C. smintheus* Bates have been collected in the same vicinity, not only at Loma del Gato, the type locality of the latter species, but at Santiago by Mr. F. E. Church, there is evidence that *smintheus* occurs in deep woods while *herophile* is found in more open areas.

In Hispaniola the closely related species *confusa* Lathy and *obscura* Michener are both widespread. Nothing is known of

possible ecological differentiation between them, but both have been collected at the same locality more than once. The differences in color and pattern between them are in many ways parallel to those between the two subspecies of *hysius*, one of which is found to the northeast, the other to the southwest of the Cul-de-Sac and Enriquillo depression. Perhaps the species *confusa* and *obscura* differentiated at a time when this depression was a seaway, which it evidently was until relatively recently, and since it was elevated above sea level each spread to occupy the whole of Hispaniola.

### CALISTO HÜBNER

*Calisto* HÜBNER, 1823, Zutr. z. Samml. exot. Schmett., II, p. 16.

GENOTYPE: *Papilio zangis* Fabricius, designation of Butler, 1868, Ent. Monthly Mag., IV, p. 194.

Scudder (1875, Proc. Amer. Acad. Arts Sci., X, p. 130) gives *herophile* Hübner as the genotype, stating that it was the sole species included in the genus by Hübner. This is not true, *zangis* having been mentioned by Hübner. Hence Butler's designation stands.

This genus may be distinguished from other Satyrinae by the position of the branches of the radius of the forewing. Vein  $R_1$  arises at or beyond the apex of the discal cell.

### ARTIFICIAL KEY TO THE SPECIES OF *Calisto* (MODIFIED FROM THAT OF BATES, 1935)

- 1.—Hind wing with two ocellar spots on under surface..... 2.  
Hind wing with a single ocellar spot on under surface..... 3.
- 2.—Under surface with large areas of red-brown and fulvous..... *arcas*:  
Under surface fuscous except for the usual lines and ocellar spots..... *grannus*.
- 3.—Discal cell of forewing on under surface red or partly so, this red area much brighter than any red of hind wing..... 4.  
Discal cell of forewing on under surface fuscous, or if red, not or scarcely brighter than red of under surface of hind wing..... 14.

<sup>1</sup> Ernst Mayr, 1942, Systematics and the origin of species, xiv + 334 pp., 29 figs., Columbia University Press, New York.

4.—Red of under surface of discal cell of forewing extending beyond cell, or a separate red spot present beyond cell..... 5.  
 Red of under surface of discal cell of forewing not extending beyond cell, although sometimes extending a little behind it..... 7.

5.—Basal half of forewing almost entirely red on under surface..... *lyceius*.  
 Two separate red areas on under surface of forewing, one in cell, the other behind ocellar spot..... 6.

6.—Forewing over 15 mm. in length; area in front of ocellar spot of hind wing usually purplish..... *hysius hysius*.  
 Forewing under 15 mm. in length; area in front of ocellar spot of hind wing not or scarcely purplish..... *hysius batesi*.

7.—Red area of under surface of discal cell of forewing demarcated distally by a dark line..... 8.  
 Red area of under surface of discal cell of forewing not demarcated distally by a dark line..... 10.

8.—Ground color of under surface gray; red area of under surface of discal cell of forewing broader than long..... 9.  
 Ground color of under surface fuscous; red area at least as long as broad..... *smintheus smintheus*.

9.—Postmesial lines of under surfaces of fore and hind wings bordered distally with pale shading..... *herophile herophile*.  
 Postmesial lines of under surface of fore and hind wings not bordered distally with pale shading..... *herophile apollinis*.

10.—Red area of under surface of discal cell of forewing oval, not reaching posterior margin of cell..... *delos*.  
 Red area of under surface of forewing almost covering discal cell..... 11.

11.—Forewing length over 20 mm..... 12.  
 Forewing length under 16 mm..... 13.

12.—Dark lines of under surfaces of wings not marked by pale shading..... *eleleus*.  
 Dark lines of under surfaces of wings margined distally by pale shading..... *smintheus muripetens*.

13.—Postmesial line of under surface of hind wing conspicuously sinuate, margined distally by conspicuous whitish line; area in front of ocellar spot of hind wing purplish..... *confusa*.  
 Postmesial line of under surface of hind wing not or scarcely sinuate, with relatively little pale shading distal to it; area in front of ocellar spot of hind wing not purplish..... *obscura*.

14.—Under surface of hind wing with a prominent orange or white median band..... 15.  
 Under surface of hind wing without such a band..... 16.

15.—Hind wing with a single, solid band on under surface from the costal to the inner margin..... *archebates*.  
 Hind wing with band of under surface interruptedly forked at end of cell, one branch going to the middle of inner margin, the other to anal angle..... *chrysaoros*.

16.—Ocellar spot of forewing with a single central bluish white dot;  $R_1$  of this wing arising near the end of the cell..... 17.  
 Ocellar spot of forewing with a central and a posterior dot;  $R_1$  of this wing arising at some distance beyond end of cell..... 18.

17.—Outer margin of hind wing distinctly produced at the anal angle; ocellar spot of this wing minute or absent..... *chrysaoros*.  
 Outer margin of hind wing evenly rounded to anal angle; ocellar spot of this wing distinct..... *loxias*.

18.—Under surface of hind wing with a distinct ferruginous cast to the ground color..... 19.  
 Under surface of hind wing fuscous or dark gray with no trace of ferruginous..... 21.

19.—White postmedian dots of under surface of hind wing forming an even row from the ocellar spot toward the costal margin..... 20.  
 White dot of cell  $M_3$  absent, that of  $M_2$  displaced toward end of cell..... *pulchella*.  
 20.—Male with a prominent round patch on upper surface of forewing, consisting of a silky ring of coarse scales around a central area of fine closely appressed scales; female with ferruginous cast of under surface of forewing limited to basal half of wing..... *zangis*.  
 Area of specialized scales of forewing of male diffuse, not sharply marked into zones; female with ferruginous cast on under surface of forewing extending behind the ocellar spot to the submarginal area..... *nubila*.  
 21.—Ocellar spot of hind wing small, round, with white spot central; no postmedian row of white dots on under surface of hind wing..... *tragi*.  
 Ocellar spot of hind wing ovoid, with white spot basal; row of four white dots extending from the ocellar spot to the costal margin present on under surface of hind wing..... *sibyla*.

**Calisto chrysaoros** Bates

A new locality record is Mt. Tuia, Dominican Republic, January, 1917.

**Calisto hysius** (Godart)

This species appears to be widespread in Hispaniola. It is, however, separable into

The subspecies of the region northeast of the Cul-de-Sac and Enriquillo basin may be known as:

**Calisto hysius batesi**, new subspecies

This subspecies is distinguishable from *hysius hysius* as indicated in the following tabulation:

*C. hysius batesi*

Length of forewing, 12.5–14.5 mm.

UNDER SURFACE

Ground color lighter brown.

Red of under surface rather orange.

Dark postmesial line of fore and hind wings only inconspicuously margined with pale scales.

White dots in front of ocellar spot of hind wing inconspicuous, usually two in number.

Area in front of ocellar spot of hind wing with little or no purplish cast.

*C. hysius hysius*

Length of forewing, 15–18 mm.

UNDER SURFACE

Ground color dark brown.

Red of under surface dark.

Dark postmesial line of fore and hind wings frequently margined distally by a rather broad band of pale yellowish gray.

White dots in front of ocellar spot of hind wing conspicuous, usually three or four in number.

Area in front of ocellar spot of hind wing usually conspicuously purplish.

UPPER SURFACE

Red areas absent, or if present usually only on hind wings of females.

Post discal area of forewing in females and of hind wing in females and some males with more or less conspicuous suffused red areas.

two well-marked subspecies, a larger one found southwest of the Cul-de-Sac Plain and Enriquillo basin and a smaller one found northeast of this depression. From Godart's allusion to grayish lines across the under surfaces of the wings and to three white dots in front of the ocellar spot of the hind wings, it seems probable that his specimens were of the southwestern subspecies. This is the form which Bates (1935), who had never seen the northeastern subspecies, considered as *hysius*.

**HOLOTYPE.**—Male, Sanchez, Dominican Republic, May 11–16, 1915.

**ALLOTYPE.**—Female, same locality, May 17–21, 1915.

**PARATYPES.**—Ten males and two females. Three with the data of the holotype; one with that of the allotype; one topotypical, June 30 to July 4, 1915; one topotypical, April 23, 1930; one, Kato Mayor, Dominican Republic, July 21, 1935 (W. G. Hassler); one, Puerto Plata, Dominican Republic, May 7–8, 1915; two,

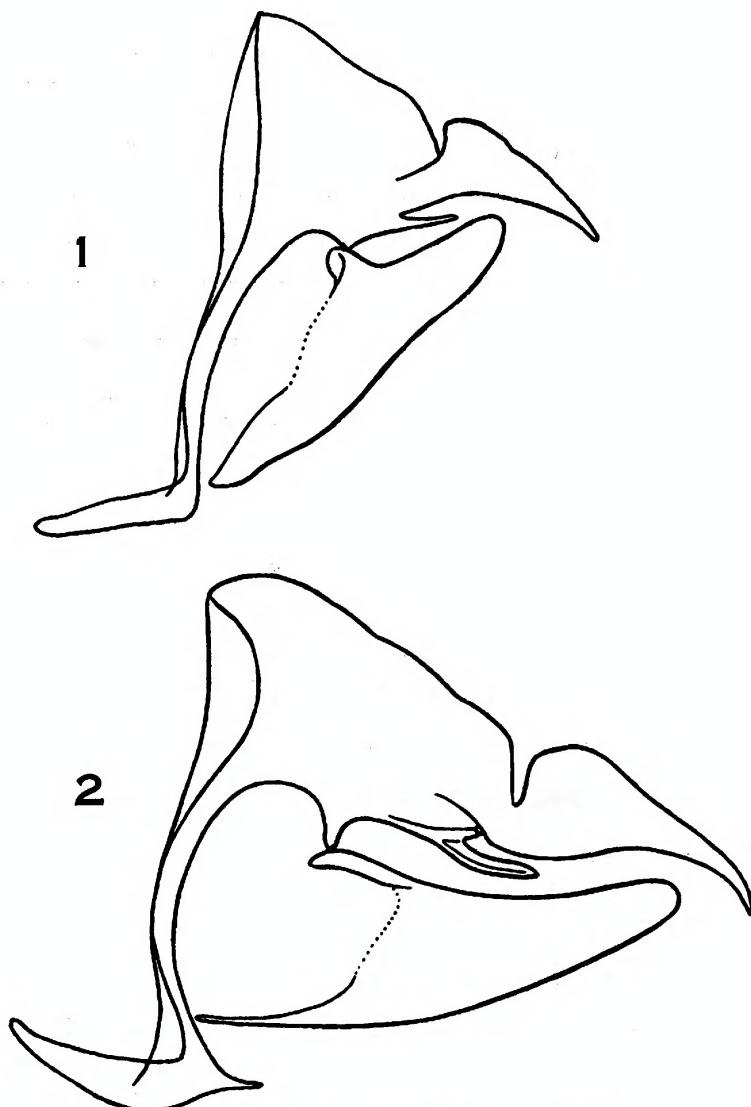


Fig. 1. Lateral view of genitalia of *Calisto confusa* Lathy.  
 Fig. 2. Lateral view of genitalia of *Calisto obscura*, new species.

Las Matas, Dominican Republic, June 27 and 30, 1940 (one from Arroyo Sabana Miguel) (J. G. Needham, Cornell University collection); two, Mt. Puilboreau, Ennery, Haiti, 3000 feet altitude, July 10, 1935.

#### *Calisto hysius hysius* (Godart)

Specimens in The American Museum of Natural History are from Aux Cayes, Haiti, March and June; Paradis, Domini-

can Republic, 1800 feet altitude, August; Valle de Polo, Barahona, Dominican Republic, 2500 feet altitude, August.

#### *Calisto confusa* Lathy

Under this name Bates (1935) apparently confused two closely related species. Lathy in 1899 recognized them as distinct, calling one *confusa*, the other *hysius*, but this use of the name *hysius* is clearly incorrect. The distinguishing features of the

two species will be tabulated under the description of *obscura*.

Localities for *confusa* are as follows:

DOMINICAN REPUBLIC: La Vega, Santiago, Sanchez, Kato Mayor, San Lorenzo, Puerto Plata, Barahona (and Valle de

Boston Soc. Nat. Hist., VIII, p. 237 [variety B only].

This species apparently flies with its close relative, *confusa*, in many parts of its range. The differences between *obscura* and *confusa* are indicated in the following tabulation:

*C. obscura*

UNDER SURFACE

Ground color lighter, brown.  
Red of discal cell of forewing light.  
Ocellar spot of forewing with posterior blue dot usually as far from posterior margin as anterior dot is from anterior margin.

Postmesial dark lines of fore and hind wings usually margined outwardly with pale brown, but little lighter than ground color.

Subapical wavy lines of hind wing rarely much closer posteriorly than anteriorly, area between them nowhere much lighter than ground color.

Postmesial line of hind wing but little sinuate (although often crenulate) and scarcely nearer wing base in cell Cu<sub>1</sub> than elsewhere.

Anal angle of hind wing without dark area.  
Ocellar spot of hind wing not occupying full width of cell Cu<sub>1</sub>, frequently small or even very minute.

Area in front of ocellar spot of hind wing brown, not differing from ground color.

Row of white dots in front of ocellar spot of hind wing inconspicuous, usually two in number.

*C. confusa*

UNDER SURFACE

Ground color rather dark, brownish gray.  
Red of discal cell of forewing dark.  
Ocellar spot of forewing with posterior blue dot nearer margin than anterior dot.

Postmesial dark lines of fore and hind wings usually margined outwardly with more or less broad creamy white bands.

Subapical wavy lines of hind wing about half as far apart posteriorly as anteriorly, area between them creamy white in posterior half of wing in contrast to adjacent areas.

Postmesial line of hind wing conspicuously sinuate (and but little crenulate) so that it is distinctly nearer the wing base in cell Cu<sub>1</sub> than elsewhere.

Anal angle of hind wing with small black area.  
Ocellar spot of hind wing usually occupying entire width of cell Cu<sub>1</sub>.

Area in front of ocellar spot of hind wing with a purplish cast.

Row of white dots in front of ocellar spot of hind wing conspicuous, usually four in number.

UPPER SURFACE

Androconial area of male with outer margin nearer outer wing margin posteriorly than anteriorly.

Androconial area of male with outer margin approximately parallel to outer margin of wing.

MALE GENITALIA

Apical portion of uncus curved downward.  
Basal articulation of harpé shorter than free portion of harpé.

Apical portion of uncus nearly straight.  
Basal articulation of harpé longer than free portion of harpé.

Polo, 2500 feet altitude), Las Matas, Santo Domingo City. HAITI: Port-au-Prince, Kenscoff (4800 feet altitude), Bizeton, Aux Cayes, Pétionville, Trouin, Diquini, Pivert. Among the series from these localities are specimens collected in every month of the year except February, September, October and November.

HOLOTYPE.—Male, Pétionville, Haiti. 1600 feet altitude, January 24-29, 1922.

ALLOTYPE.—Female, same locality and date, 2260 feet altitude.

**Calisto obscura**, new species

*Calisto hysius*, LATHY (not Godart), 1899, Trans. Ent. Soc. London, p. 226; WEYMER, 1911, in Seitz, Macrolepidoptera of the World, V, p. 240; HALL, 1925, Entomologist, LVIII, p. 165. *Calisto confusa*, BATES, 1935, Occas. Papers

PARATYPES.—Thirty-two males and twenty-two females. DOMINICAN REPUBLIC: two, La Vega, May 14, 1915; one, Main Road, Province of La Vega, March 13, 1931; one, one mile east of Monte Cristo, March 6, 1931; two, three miles west of Santiago, 2000 feet altitude, March 15, 1931; three, Puerto Plata, May 7-8, 1915; one, Monserrat, July 20-22, 1934; one, Manzanillo Bay, February 27, 1931;

three, Barahona, July 6-11 and 20-26, 1932; one, Kato Mayor, July 21, 1935; three, Chacquey, 1200 feet altitude, February 26-28, 1931; one, Santo Domingo City, December-January. HAITI: Thirteen, Port-au-Prince, 300 to 500 feet altitude, January 14-23, 1922, February 2-4, 1922, March 21, 1924, April 8-11, 1922; nine, Aux Cayes, March 15-20, 1922; one, Trouin, 500 feet altitude, April 1, 1935; three, Ravine of Pétionville, 1500-1600 feet altitude, January 24-29, 1922; one, Jeremie, June 17, 1930; one, Bizeton, December 25, 1921; three, Pétionville, 1600-2250 feet, January 24-29, 1922; two, Pétionville, May 31 and June 2, 1930 (O. Fulda, Cornell University collection); one, Carrefour, January 7, 1922; one, Point Beudet, 100 feet altitude, March 3-4, 1922.

#### Calisto lyceius Bates

This species, previously known from but three specimens, is represented in The

American Museum of Natural History collection by material from near Monte Cristo, Dominican Republic, March 6 and 13, 1931; Rio Yaque, ten miles south of Monte Cristo, February 25, 1931; eight miles east of Monte Cristo, February 28, 1930; Manzanillo Bay, Dominican Republic, February 27, 1931; and Chacquey, Dominican Republic, 1200 feet altitude, all collected by A. L. Stillman.

Most of the females possess a more or less extensive suffused red median area on the upper side of each forewing, which is not mentioned in the original description.

#### Calisto herophile Hübner

Four specimens from the Isle of Pines do not appear to differ from a large Cuban series. The species has previously been recorded from the Isle of Pines by Holland.<sup>1</sup>

<sup>1</sup> W. J. Holland, 1916, The Lepidoptera of the Isle of Pines, etc. Ann. Carnegie Mus., X, pp. 487-518, Pl. xxi.

### LIST OF DESCRIBED SPECIES OF CALISTO

#### Group I

*loxias* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 233 (Hispaniola).  
*archebates* (MÉNÉTRIÉS), 1832, Bull. Soc. Imp. Nat. Moscou, V, p. 313 (Hispaniola) [*Satyrus*]; 1834, Nouv. Mém. Soc. Imp. Nat. Moscou, III, p. 131 [*Satyrus*].  
*chrysaoros* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 235 (Hispaniola).  
*arcas* BATES, 1939, Psyche, XLVI, p. 48 (Hispaniola).

#### Group II

*tragius* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 236 (Hispaniola).  
*hysius hysius* (GODART), 1821, in Latreille and Godart, Encycl. Méth., IX, p. 525 (Hispaniola) [*Satyrus*].  
*lysius* (MÉNÉTRIÉS), 1832, Bull. Soc. Imp. Nat. Moscou, V, p. 314 [*Satyrus*].  
*hysius batesi* MICHENER, present paper (Hispaniola).  
*confusa* LATHY, 1899, Trans. Ent. Soc. London, p. 227 (Hispaniola).  
*obscura* MICHENER, present paper (Hispaniola).  
*lyceius* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 240 (Hispaniola).  
*grannus* BATES, 1939, Psyche, XLVI, p. 49 (Hispaniola).

#### Group III

*herophile herophile* HÜBNER, 1823, Zutr. z.

Samml. exot. Schmett., II, p. 16 (Cuba, Isle of Pines).

*herophile apollinis* BATES, 1934, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 136 (Bahamas).

*smintheus smintheus* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 242 (Cuba).

*smintheus muripetens* BATES, 1939, Mem. Soc. Cubana Hist. Nat. "F. Poey," XIII, p. 3 (Cuba).

*delos* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 243 (Cuba).

*sibyla* BATES, 1934, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 136 (Bahamas).

#### Group IV

*eleleus* BATES, 1935, Occas. Papers Boston Soc. Nat. Hist., VIII, p. 245 (Hispaniola).

#### Group V

*zangis* (FABRICIUS), 1775, Syst. Ent., p. 486 (Jamaica) [*Papilio*].

*agnes* (CRAMER), [1780], Pap. Exot., IV, p. 73, Pl. CCCXV [*Papilio*].

#### Group VI

*pulchella* LATHY, 1899, Trans. Ent. Soc. London, p. 225 (Hispaniola).

*tenebrosa* LATHY, 1899, Trans. Ent. Soc. London, p. 225.

#### Group VII

*nubila* LATHY, 1899, Trans. Ent. Soc. London, p. 223 (Puerto Rico).